Parth Pundalik Pai

Curriculum Vitae

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Education

2022–26 **Indian Institute of Technology Bombay (IITB), Mumbai, India | GPA: 8.74/10**,
Bachelor of Technology in Mechanical Engineering,
Minor degree in Artificial Intelligence and Machine Learning

2025 **KTH Royal Institute of Technology, Stockholm, Sweden**,
Industrial Engineering and Management, Semester Exchange

Research Interests

Data Science, Machine Learning, Artificial Intelligence, Optimization

Research & Professional Experience

2025 **Associative Memory tasks for Adaptive LIF Neurons**
Research Assistant at KTH Stockholm, Sweden | Guide: Prof. Anders Lansner and Prof. Pawel Herman
- Implemented discrete leaky integrate-and-fire (LIF) spiking model, to mimic biological brain function
- Trained network on 350+ clear images, and tested recall on their distorted versions to reproduce clear patterns
- Assessed recall accuracy across n x n (n=10, 14, 16) discrete LIF networks vs continuous graded networks
- Quantified cutoff training patterns for 95% recall accuracy, revealing 28%, 25% and 40% deviations between LIF and continuous neuron models across 10×10, 14×14 and 16×16 network sizes

2025 **Machine Learning Intern**, *Jaguar Land Rover - TBSI (JLR), Bangalore, India*
Digital Twin: Neural Network based Surrogate Modelling in Vehicle Dynamics | Guide: Prof. N Vyas
- Developed parallelized Python pipeline using CarMaker APIs, reducing end-to-end simulation time by 96%
- Preprocessed data from 100k+ simulations generated using latin hypercube sampling for 27 input parameters
- Built Artificial neural networks to predict Roll, Understeer & Jacking with R^2 of 95% and RMSE/range < 0.05
- Implemented Optuna to infer vehicle input parameters for target metrics, accelerating design workflow by 75%

2023 **Model Predictive Control on CubeSat**, *IITB Student Satellite Program - (IITBSSP)*
Controls Researcher in the Technical Team | Guide: Prof. Varun Bhalerao
- Worked on 1U CubeSat satellite (10cm × 10cm × 10cm), focusing on altitude & position control development
- Designed Model Predictive Control (MPC) algorithm, stabilizing CubeSat attitude, reducing yaw rate by 10%
- Improved CubeSat positional stability by upgrading the control system from PID to receding horizon MPC

Course Projects

2024 **Machine Learning based analysis of external flow around Air-Foil**
Course: Applied Data Science and Machine Learning (ME228) | Guide: Prof. Alankar Alankar
- Built a computer-vision pipeline to extract and map 1M+ flow-field datapoints into high-res streamline plot
- Derived numerical streamline density & trained MLP achieving 93% accuracy in predicting pressure-coefficient
- Trained and tuned a Random Forest Regressor model across 10k+ air-foil configurations optimizing Camber value and angle-of attack attaining an R^2 score of 95%

2023 **Machine Learning Based Movie-Recommendation System**
Course: Staistical Machine Learning and Data Mining (ME781) | Guide: Prof. Asim Tewari
- Preprocessed a large dataset of 44k+ movies and applied AutoTokeniser to create compact description vector
- Built BERT based movie-description embeddings, comparing with prompt embeddings using cosine similarity
- Developed Gradio user interface enabling real-time prompt input and top 5 movie recommendation generation

2023 **Mountain Cargo Challenge using Arduino UNO**
Course: Introduction to Makerspace (MS101) | Guide: Prof. Ankit Jain and Prof. Dinesh Sharma
- Built a 4 wheel autonomous Line-follower robot climbing 30° inclines while transporting payload of 300 grams
- Integrated 3 IR sensors with Arduino UNO and achieved $> 95\%$ accuracy after calibration over 50+ test runs
- Appreciated as one of the best bots in MS101 course and awarded an AP grade for excpetional performance.

Scholastic Achievements

2026 Accepted into MSDS programs of University of California San Diego, University of Michigan & New-York University

2024 Selected as the **sole** nominee from IIT Bombay to KTH Royal Institute of Technology for Semester Exchange

2023 Achieved Branch Change to Mechanical Engineering awarded to top **2%** in a cohort of 1400+ students

2023 Received an **AP** grade in the Makerspace101 course, achieved by only 7 individuals out of 600+ students

2022 Secured the **98th** percentile in **IIT-JEE Advanced** examination taken by nearly 150k+ candidates nationwide

2022 Achieved a **99.7** percentile score in the **IIT-JEE Mains** among 1 million candidates across the country

Technical Projects

2025 **Dashboard development for Battery Health monitoring** | JLR Global Hackathon
- Developed ML based Battery Health Monitoring system using NASA's Battery SOC data with 700k+ datapoints
- Trained LSTM & Random Forest models with R^2 of 90% estimating battery health from SOC time-series
- Developed dashboard for real-time battery monitoring & created an interactive UI using Gradio all in 36 hours

2024 **Music Generation using RNNs and LSTMs** | Season of Code 2024, Web and Coding Club, IIT Bombay
- Preprocessed 300+ Deutsch folk songs from ESAC dataset into 64-step time series sequences for model training
- Trained a 256-unit LSTM network on encoded sequence from Kern-format dataset to generate novel melodies
- Built custom inference pipeline using music21, decoding generated symbolic sequence into playable MIDI notes

2023 **Reinforcement learning for Atari Breakout** | Season of Code 2023, Web and Coding Club, IIT Bombay
- Built Atari Breakout environment using OpenAI Gym & processed 50k+ frames for agent-environment interaction
- Used ϵ-greedy exploration schedule from 1.0 $\rightarrow$ 0.1 over 100k steps for stable exploration-exploitation behaviour
- Implementented Frame Stacking to handle temporal dependencies and simplify the state-space complexity

Technical Skills

Software LaTeX, GitHub, Linux, Fusion 360, IPG CarMaker

Languages Python, C++, R, MATLAB, SQL, Arduino

Packages PyTorch, Transformers, Sckit-Learn, Numpy, Pandas, Matplotlib, Keras, HuggingFace

Relevant Coursework

ML Applied Data Science & Machine Learning, Statistical Machine Learning & Data Mining, Speech & Natural Language Processing & the Web, Intro to Machine Learning, Programming in Data Science

Math Linear Algebra, Differential Equations, Differential Calculus, Integral Calculus, Mathematical Methods in Engineering, Probability and Stochastic Processes I, Statistical Design of Experiments, Makerspace

Others Computer Programming & Utilization, Operations Modelling and Analysis, Introduction to Cryptography

Teaching and Mentorship

2024 **Undergraduate Teaching Assistant** | Course: Staistical ML and Data Mining | Guide: Prof. Asim Tewari
- Served as a TA for ME781, a 300 student course on Statistical ML & Data Mining by Mechanical Department
- Handled multiple student queries, providing timely clarification on ML concepts and evaluation criteria
- Assisted faculty with in-class quizzes, exam logistics, grading workflows and overall course administration

2024 **Project Mentor** | Season of Code 2024 & Summer of Science 2024, IIT Bombay
- Mentored a group of 10+ students in Season of Code on Predictive Modelling using Time-Series Forecasting
- Mentored 10+ students in Summer of Science on Large Language Models, teaching theory of LLMs
- Curated and Delivered 20+ high quality resources, conducting structured learning over an 8-week program

Extra Curriculars

Music
- Awarded Best Flautist – Special Mention for exceptional flute performance at Symphony's Battle of the Bands
- Won Gold Medal in Stageplay Music at 6th Inter-IIT Culturals Meet held at IIT Kharagpur, India
- Obtained Junior Hindustani Classical Music certification from Karnataka Board after 7 years of vocal training

Others
- Volunteered in the Versova Beach Cleaning program hosted by Abhyuday, the social body of IIT Bombay
- Mentored 100+ High-school students in Science & Mathematics as part of World Konkani Community Outreach
- Elected as First-Year Class Representatives, facilitating academic communication between department students